

### 3. CHEMICAL AND PHYSICAL INFORMATION

#### 3.1 CHEMICAL IDENTITY

Table 3-1 lists common synonyms, trade names, and other pertinent information to identify boron and selected compounds.

#### 3.2 PHYSICAL AND CHEMICAL PROPERTIES

Table 3-2 lists important physical and chemical properties of boron and selected compounds.

TABLE 3-1. Chemical Identity of Boron and Compounds<sup>a</sup>

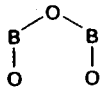
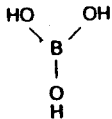
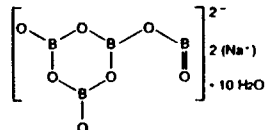
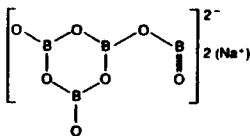
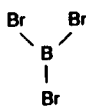
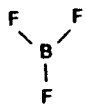
Characteristic	Boron	Boron oxide	Boric acid	Borax
Synonyms	No data	Boric anhydride; diborontrioxide	Boracic acid; orthoboric acid	Borax decahydrate; tincal; polybor
Trade name	No data	No data	No data	No data
Chemical formula	B	B <sub>2</sub> O <sub>3</sub>	H <sub>3</sub> BO <sub>3</sub>	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> · 10H <sub>2</sub> O
Chemical structure <sup>b</sup>	Not applicable			
Identification numbers:				
CAS Registry	7440-42-8 <sup>a</sup>	1303-86-2	10043-35-3	1303-96-4 <sup>a</sup>
NIOSH RTECS	ED7350000 <sup>a</sup>	ED7900000 <sup>a</sup>	ED4550000 <sup>a</sup>	VZ2275000 <sup>a</sup>
EPA Hazardous Waste	No data	No data	No data	No data
OHM/TADS	7216607 <sup>f</sup>	No data	7216606 <sup>f</sup>	No data
DOT/UN/NA/ IMCO Shipping	No data No data	No data No data	No data No data	No data No data
HSDB	4482 <sup>f</sup>	1609 <sup>f</sup>	1432 <sup>f</sup>	0328 <sup>f</sup>
NCI	No data	No data	No data	No data

TABLE 3-1 (Continued)

Characteristic	Borax, anhydrous	Boron tribromide	Boron trifluoride
Synonyms	Borax, dehydrated; sodium tetraborate, anhydrous	Boron bromide	Boron fluoride
Trade name	No data	No data	No data
Chemical formula	$\text{Na}_2\text{B}_4\text{O}_{10}$	$\text{BBr}_3$	$\text{BF}_3$
Chemical structure <sup>b,c</sup>			
Identification numbers:			
CAS Registry	1303-96-4	10294-33-4	7637-07-2
NIOSH RTECS	VZ2275000 <sup>a</sup>	ED7400000 <sup>a</sup>	ED2275000 <sup>a</sup>
EPA Hazardous Waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/ IMCO Shipping	No data No data	UN2692 <sup>f</sup> No data	UN1008 <sup>f</sup> IMCO 2.3
HSDB	0328 <sup>f</sup>	0327 <sup>f</sup>	0325 <sup>f</sup>
NCI	No data	No data	No data

<sup>a</sup>All information obtained from Sax and Lewis 1987, except where noted.

<sup>b</sup>Grayson 1985

<sup>c</sup>Morrison and Boyd 1983

<sup>d</sup>EPA 1987b

<sup>e</sup>Sittig 1985

<sup>f</sup>HSDB 1989

CAS = Chemical Abstracts Service

DOT/UN/NA/IMCO = Department of Transportation/United Nations/North America/International Maritime Dangerous Goods Code

EPA = Environmental Protection Agency

HSDB = Hazardous Substances Data Bank

NCI = National Cancer Institute

NIOSH = National Institute for Occupational Safety and Health

OHM/TADS = Oil and Hazardous Materials/Technical Assistance Data System

RTECS = Registry of Toxic Effects of Chemical Substances

TABLE 3-2. Physical and Chemical Properties of Boron and Compounds<sup>a</sup>

Property	Boron	Boron oxide	Boric acid	Borax
Molecular weight	10.81	69.62	61.83	381.37
Color	Black or brown	Colorless	Colorless	Colorless
Physical state	Solid	Solid	Solid	Solid
Melting point	2300°C	450±2°C	169°C±1 tr to HBO <sub>2</sub>	75°C, -8H <sub>2</sub> O, 60°C
Boiling point	2550°C	1500°C <sup>b</sup>	-1% <sup>b</sup> H <sub>2</sub> O, 300°C	-10H <sub>2</sub> O, 320°C
Density at 20°C	2.34	2.46	1.435 at 15°C	1.73
Odor	No data	No data	Odorless <sup>b</sup>	Odorless <sup>c</sup>
Odor threshold:				
Water	No data	No data	No data	No data
Air	No data	No data	No data	No data
Solubility:				
Water	Insoluble	Soluble in hot water; slightly soluble in cold water	63.5 g/L at 30°	20.1 g/L at 0°C
Organic solvents	Soluble in nitric and sulfuric acid <sup>b</sup>	Soluble in alcohol <sup>b</sup>	Soluble in alcohol, glycerol	Slightly soluble in alcohol, glycerol
Partition coefficients:				
Log octanol/water	No data	No data	No data	No data
Log K <sub>ow</sub>	No data	No data	No data	No data
Vapor Pressure	1.56x10 <sup>-5</sup> atm at 2140°C <sup>c</sup>	No data	No data	No data
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	No data	Noncombustible <sup>b</sup>	Noncombustible <sup>b</sup>	No data
Flashpoint	No data	No data	No data	No data
Flammability limits	No data	No data	No data	No data
Conversion factors	No data	No data	No data	No data

TABLE 3-2 (Continued)

Property	Borax, anhydrous	Boron tribromide	Boron trifluoride
Molecular weight	201.22	250.52	67.81
Color	Colorless	Colorless	Colorless
Physical state	Solid	Liquid	Gas
Melting point	741°C	-46°C	-126.7°C
Boiling point	Decomposes at 1575°C	91.3±0.25°C	-99.9°C
Density at 20°C	2.37	1.69 at 15°C <sup>b</sup>	2.99 g/L
Odor	Odorless <sup>c</sup>	No data	Pungent <sup>c</sup>
Odor threshold:			
Water	No data	No data	No data
Air	No data	No data	4.5 mg/m <sup>3d</sup>
Solubility:			
Water	10.6 g/L at 0°C; 87.9 g/L at 40°C	Decomposes	1060 g/L at 20°C
Organic solvents	Insoluble in alcohol	Soluble in alcohol, CCl <sub>4</sub>	Soluble in sulfuric acid
Partition coefficients:			
Log octanol/water	No data	No data	No data
Log K <sub>oc</sub>	No data	No data	No data
Vapor Pressure	No data	100 mmHg at 33.5°C <sup>f</sup>	40 mmHg at -131.0° (solid) 760 mmHg at -110.7°C (liquid) <sup>f</sup>
Henry's law constant	No data	No data	No data
Autoignition temperature	Noncombustible <sup>b</sup>	No data	Noncombustible <sup>b</sup>
Flashpoint	No data	No data	No data
Flammability limits	No data	No data	No data
Conversion factors	No data	No data	No data

<sup>a</sup>All information obtained from Weast 1985, except where noted.

<sup>b</sup>Sax and Lewis 1987

<sup>c</sup>ACGIH 1986

<sup>d</sup>Ruth 1986

<sup>e</sup>Windholz 1983

<sup>f</sup>HSDB 1989

